GLAST Monthly PSR

Accomplishments

September 10, 2004

GLAST Monthly Status Review

Agenda

September 10, 2004

1.	**Systems**	**J Leibee**
2.	**LAT**	**B Graf**
3.	**GBM**	**B Browne**
4.	**Spacecraft**	**J Bretthauer**
5.	**Flight Software**	**E Andrews**
6.	**Ground System**	**K Lehtonen**
7.	**GSSC**	**J Norris**
8.	**Launch Services**	**M Goeser**

Systems Engineering - Accomplishments

- **Developed draft white paper for space asset protection**
- **Began development of draft Orbital Disposal Plan**
- **Performed an updated RFA response for SASS concerning the MAR compliance audit**
  - Review with management 9/17
- ***Prepare for AETD Pointing Review***
  - Completed integration of the observatory-level thermal model and completed benchmark test cases
  - Work has begun on running the first test case, using 96 points per orbit (once per minute) to check on the orbit transient thermal-mechanical distortion performance.
  - Produce multiple error budgets wrt star tracker configuration and observing modes for nominal and worst cases
  - Closure of most RFAs
- ***Mission robustness task***
  - Command authentication task almost complete: implementation using existing software
  - Augmentation of troubleshooting and diagnostics: is study of hardware changes really worth the effort?
  - Augmented fault detection, isolation, and recovery: additional alert messages, gyroless safemode
- ***Revised Power on at Launch requirements to simplify implementation***
  - S-band xmitter on via timer: second inhibit for Ku-band xmitter
  - UCA written for both POAL and S-band antenna: ready to go
- ***Scheduled Fault Management TIM for September 30th***
  - New DAS alerts for faults less than safe mode (SSR failure, for example)
  - CPU fail-overs and watchdogs: Charge control unit fail overs: Re-entry fault protection

Safety & Mission Assurance - Accomplishments

GLAST Software/IV&V

Accomplishments

- Participated in the first of many Spacecraft FSW code walkthroughs being held in September.
- Findings from the April 2004 software configuration management audit at Spectrum were closed.
- The GLAST Software Quality Assurance Plan is now ready for Project Review.

Reliability

- Tony DiVenti/Reliability is continuing to coordinate an audit of the LAT part stress and derating analyses effort.
- LAT FMEA Review - Responsibility for arranging meetings assigned. Tony DiVenti is coordinating the CAL and ACD reviews, and Pat Hascall (SLAC) is coordinating the remaining reviews.
- Ku Band Solder Joint Integrity - Interviews with NASA Experts (i.e., Len Wang, Henning Leidecker, Mike Sampson) completed. Mitigation options developed for management review.

Safety & Mission Assurance - Accomplishments

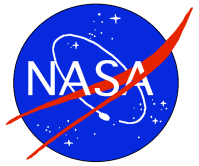
Parts & Materials

- Resolved issues related to ASIC derating and issues are closed.
- Resolved issues related to the use of the existing leaky NOVACAP capacitor on the TKR MCMs. All future assemblies will use the new capacitors from the new lot, which is under testing and the results will be available on 9/16/04 for DAQ and TKR.
- Issues related to the use of polyswitches were resolved during the telecom with GSFC. Polyswitch qualification and DPA is in process.
- Conducted parts control board meeting in which issues related to outgassing of the connector and connector assembly were discussed.

Safety

- All Range Safety comments to the MSPSP have been catalogued. There are still some expected from KSC. The information needed to answer the initial comments is being gathered with approximately 10% done.

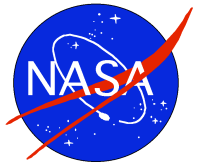
Safety & Mission Assurance - Accomplishments



QE Resident at SLAC

- Performed on-going Source inspection at Zentek on Reworked Multi-Chip Module (MCM) assemblies with regards to the Resistor clocking issue. All 250 assemblies have completed rework.
- Performed QA survey at General Technology (GTC) in Albuquerque, New Mexico. GTC will be manufacturing The Data Acquisition Electronics (DAQ).
- Performed QA survey at Six Sigma in Milpitas , Ca. Six Sigma will be performing lead tinning on all Flat pack formed parts related to the DAQ Electronics. Fancort (located in New Jersey) will be performing the lead forming process.
- Grid #1 has completed the final machining phase and is in process for alodining and plating.

Safety & Mission Assurance - Accomplishments



QE Resident at Spectrum

- Completed vibration testing on the 6U (Type of standard PCI card that represents the type used in building the system) for Gold fretting on the ERNI connectors.Testing was completed and is considered a success in that no bare metal was exposed, no large particles were worn off, and all particles were encapsulated in the individual pin slot.
- A LAT/SIIS Non-Flight harness was manufactured using Comerics EMI shield wrap. Testing in a Thermal Vac environment is going to be conducted to determine the "Bake out " environment needed to remove any volatiles from the manufacturing process at Comerics, where WD-40 is used. With this process the harness is not approved for use unless volatiles are removed during the bake out. Engineers at Spectrum believe that they have the correct settings to remove the volatiles from the WD-40.
- The GLAST Mock up model is complete and is being used to route the harnesses as they are being built for the flight unit. This mock up ensures that the flight harness is an exact fit for all terminations and connections for the flight instruments.

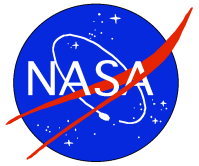
LAT Instrument - Accomplishments

- *Tracker*
  - *Tiger Team investigating the de-lamination issue completed work in Italy; expecting report on findings*
  - *PARLEX flex cables failed coupon testing; investigation underway*

- *Calorimeter*
  - *AFEE board issues resolved; six boards through conformal coat; first four boards integrated on FMA*
  - *Completed successful Test Readiness Review for flight units*
  - *EMI/EMC testing early next week.*

- *Electronics*
  - *All Test Stands shipped to sub-systems*
  - *All I&T test stands delivered*
  - *Tested/Burned-in/Tested 304 GTCC's and 152 GCCC's*
    - *no failures post burn-in*
    - *sufficient number for TEM's*
  - *Detailed production schedules completed for TEM/TPS*
    - *GASU/GASU-PS/PDU/SIU production schedules underway*
  - *Gave go-ahead for BAE to order PROM's; decision pending*
  - *Investigation on-going on MEC production line for FPGA's*
  - *FSW engineering release to I&T*
  - *Project and LAT Electronics completed final review of the use and application of poly-switches*
  - *FSW peer review scheduled for September 16*

LAT Instrument – Accomplishments (con't)



- ***ACD***

  - ***All flight FREE boards complete***
  - ***Delivered "mini-ACD" to SLAC***
  - ***Found and resolved a noise problem In the HVBS; corrective action was to add a capacitor***
    - ***completed re-assembly of the QUAL/SPARE unit***

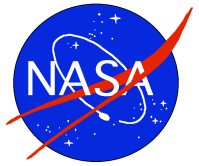
- ***Mechanical Systems***
  - ***GRID # 1 inspection prior to plating complete***
    - ***alodine operations complete and nickel started***

  - ***GRID # 2 finish machining underway***
  - ***All flight VCHP's charged and leak tested***
  - ***Successfully completed X-LAT heat pipe bonding trials***

GBM – Accomplishments

- ***SwRI completed DPU EU#2 updates, unit will be returned to NSSTC this week. Additional testing planned before GSIS delivery.***
- ***GBM completed Load Simulator testing, report released. General Dynamics/Spectrum Astro to assess whether the simulator is suitable for delivery.***
- ***GBM believes that all problems causing DPU-FSW crashes are solved, clock pulses not sharp enough & a bug in the RTEMS operating system. Build 1 FSW verification testing has begun.***
- ***GBM has given SwRI a go-ahead to build the DPU flight boards.***
- ***Scott Kniffin completed a radiation review of the GBM electronic parts and determined that, "everything is good to go".***
- ***GBM confirmed with Germany that flight detectors will be delivered in stages though not yet reflected in the DJO schedule.***
- ***GLAST requested that General Dynamics/Spectrum Astro submit a proposal for building the EQM and flight detector thermal blankets.***

GBM - Issues/Problems



- ***Actel FPGAs – potential DPU and Power Box delivery impacts if replacement of existing FPGAs is required***
  - *DPU FPGAs are needed by late October 2004 – SwRI is telling GBM that the present FPGAs are OK, no action being taken.*
  - *Power Box FPGAs are needed by late September 2004 – Actel has told Germany that Power Box FPGAs are OK, no action being taken.*

Contract Actions

- ROMs Received:
  - Power on at Launch –Study 15; S-band Switching – Study 17; Unsolicitated; SEAKR SSR Review;
  - Action planned: request ROM for improved Breakout boxes
- Pre-PDR CDRL approval change from “approval” to “information”
  - Procurement recommends not changing contract since approval dates are not specified. Recommendation is to provide GD/SASS a letter that states the following:

    “Upon receiving approval of CDR-version CDRLs, you may consider the previous PDR-version CDRLs. The PDR version is approved based upon the PDR document submission, informal information exchanges that occurred to clarify the document, and the incorporation of agreed upon changes since PDR documented in the CDR-version CDRLs.

S/C Subsystems - Accomplishments

- **Structures:**
  - *Primary Structure -Upper ring extrusions delivered; All other primary structures components in work; Secondary Structure -Battery base plates delivered (2 sent to EP for IT battery; Most secondary structure components in work; Optical Bench Skirt in work*
- **Mechanisms:**
  - *Solar Array Substrates-New solar cell qualification test panels required for EMCORE; Updating substrate design and refreshing quotes; Qwknut - Qwknut damaged during testing – operator error; EM Qwknut sent back to vendor for rework*
- **EPS:**
  - *Chassis – Complete; PRU-Status: Lambda Test completed – better than expected performance; results being analyzed; LCBs- LCB 1 Under Test with New FPGA Code; CTB-Board Under Test; CCB-PWB Ordered; BBB- Board in Test; PDU Backplane-Board will be Re-spun for Flight; VRB - complete(DC-DC converter-New Lot is Being Built in Santa Clara on a Fast Track, Delivery in Mid Oct); FSB-Complete; PIB/SIB/Backplane/Chassis; GBM Test Harness: Manufacturing started*
- **C&DH:**
  - *BAE RAD750 [a.Two Flight Units Delivered 8/16/04; b. No evidence of fretting of cPCI connector, report being generated];*
  - *Performed Initial cPCI Transaction Tests with Boards on "A" and "B" Side: Peek and Poke Registers and Memory Space on All Boards; Memory Tests on UDL, PACI, and NVM Boards*
  - *Loaded and Executed CPU With Initial FSW Code- Successfully Demonstrated Uplink and Downlink Functionality: RAD750 Running FSW Verified COP-1 and CCSDS Functionality- Successfully Verified Interrupts From UDL and PACI ; Performed Initial Testing on SSR Command & Telemetry Interface;*
  - *Issue - Proceeding with Flight Build & Test on Boards Affected by FPGA Problem by Using Industrial Temp Non-Flight FPGAs; Boards Affected Are: UDL, PACI, NVM, LGIO, GPIO, ARM*

S/C Subsystems - Accomplishments

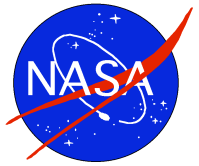
- **FSW:**
  - *Integrated FSW with PACI 1553 drivers*
  - *Completed initial IEM FSW integration*
    - ***Ported FSW to RAD750***
    - ***Updated FSW to operate with K2 and RAD750 BSPs***
    - ***Ran initial tests to demonstrate the following: uplink/downlink; CCSDS COP-1 verification; command/telemetry database; FSW housekeeping generation; UDL/PACI interrupt services; FSW schedule; inter-process communication infrastructure; telecommand & telemetry infrastructure; storage management***
    - ***Generated memo describing the initial IEM FSW integration test activity***
      - *Started development SSR drivers and command/telemetry database development*
  - *SIIS software: Implemented the interface to the GPS card to get the number of SVs in view with their respective signal strengths; Implemented command to enable/disable using GPS interface for time*
- **RF Comm:**
  - **Ku-band solder weld joint failure – GSFC recommendations provided & in project review;**
  - *Verified Ku-band Transmitter Design With TDRSS Link Testing at NASA/GSFC RF SOC; Resolved Ku-band Transmitter Freq. Stability Concern – Estimate +/- 4 kHz at Power On*

S/C Subsystems - Accomplishments

- GNC:
  - **APA & SADA: ROM in progress for life-testing; *ATP Starts in September, Waiting For Strain Relief Parts***
  - ***Subcontracts:***
  - ***Reaction Wheels-ADP In Review; "tombstone" capacitor mounting resolution discussed; GPS:Reviewed ATP, ready to start acceptance testing on receiver***
  - ***SADA: SADA and APM Qualification Telecon Held***
  - ***SIRU: TRR Scheduled for September 8th***
- Thermal:
  - ***GBM Thermal Design : MLI Closeout Blankets Between the Bus and the LAT Radiators Block Radiator Views to Space for Detectors 4 and 6; New Temperatures Are 40°C for Detectors 4 and 6: MSFC (John Sharp) is Modify the Radiator Locations to Get Back Within the Desired Operating Range***
  - ***GBM Thermal Interface: Thermal Isolation From the S/C to the Detectors Was Not Meeting 100 °C/W- Will Change the Bolt from Stainless to Titanium and the Washers from G10 to Ultem & New Design will Meet the 100 °C/Watt Requirement***
- Propulsion:
  - **Working corrosion in valves**
- Instrument Interfaces:
  - **LAT SISS delivery scheduled for 9/20-9/22. LAT SIIS harness: completed – QAR on proper cleaning of EMI shield; bake-out recommended prior to TVAC; GBM test harness DPU, PSB, & SC units wired, working routing to connectors; Test harness delivery scheduled for end of September**

J. Bretthauer

S/C FSW - Accomplishments



- *General Dynamics (GD) Writing & Testing Software.*
  - ***Flight Software.***
  - ***SIIS Software – wrapped up last week.***
  - ***Code Walkthru's ongoing.***
- *Additional reliability for software system being investigated through the current Mission Robustness Study*
  - ***Report on thru Systems***
- *IV&V Technical Issues Update*
  - ***Good communications and working relationship exists.***
  - ***Participating in CWTs. Ongoing biweekly telecon continue.***
- *Issue: SUROM: EEPROM or PROM –*
  - ***PROMs on order as risk reduction.***
  - ***Spectrum prefers not to change. RFA response indicates such.***
  - ***Awaiting costs from BAE for more complete testing after re-work***

LAT FSW - Accomplishments

- *FSW (Re) Development continues.*
  - *A number of tasks underway:*
    - ***Key Items: Inter-task / Inter-processor Communications task; LCB Driver***
  - *(redevelopment) Re-work of the LCB driver to support updates to the LCB H/W. FPGA testing complete, code testing continues through this week. Logistics of delivery to field remains to be done.*
- *FSW TEST*
  - *FSW Test Plan – V3 Baselined thru FSW CCB.*
  - *Software Test Team:*
    - ***Eric Hansen (lead) focused on ISIS (bad for FSW, good for ISIS)***
    - ***REQ/Interview for a Scientist Test Engineer (good)***
  - *Hardware continues to become more available for the FSW development and test team. Better late than never – for sure.*
  - *More additional "FSW" "Corner Test Stands" identified*
- *FSW Monthly Demo*
  - *Last demo was marginal and incomplete.*
  - *Shows that we're behind. New schedule being worked and getting approved for FUPR and MCDR.*

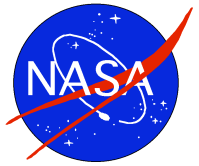
LAT Flight Software - Accomplishments

- ***FSW Flight Unit Peer Review***
  - *Charts, Charts, Charts.*
  - *Dry Runs and flip-thru done. Post to web today.*
- ***IVV Activity***
  - *Many IVV issues worked in advance of the FUPR.*
- ***Issues & Concerns***
  - *EEPROM robustness concerns*
    - *Boot code sized to fit in 64Kbytes (60.3KB)*
    - *PROMs on Order from BAE.*
    - *Ken Wagner doing some analysis/research to support a project recommendation – Late Sept / Early October.*
  - *FPGAs*
    - *Both Spectrum and SLAC have RMAs in place so –SU parts are on order. Spectrum has "delivery date" window of 11/1 – 12/15.*
    - *Retrieve copy of papers presented at MAPLD to remain current on issue*

GBM SW - Accomplishments

- *Found and fixed problem in Build 1 (Whew!)*
  - ***Involved problems in the RTEMS v4.0 O/S. (Bug fixed in v4.6.1)***
  - ***SwRI – above and beyond – no $$ and hosted MSFC team (M. Briggs) for 2 weeks.***
- *Now can re-focus on FSW testing for GBM ISIS.*
- *(GBM CDR RFA) FSW Schedule rebaseline & integration to project schedule in progress – first iteration is mid-next month.*
  - ***Held Telecon Yesterday.***
  - ***B2: All SRD/MSS requirements. (For PER)***
  - ***B2.1: Other Proposal/DPU Requirements. (For PSR)***
- *Build 1 software now integrated with Exception Handling code from SwRI.*
- *Both EM Data Processing Units (DPUs) on hand (with SIIS/SDIS) at NSSTC. (#1 to be shipped back to SwRI for the updates that #2 received.)*
  - ***#1 to be the GBM ISIS DPU***

Simulators - Accomplishments

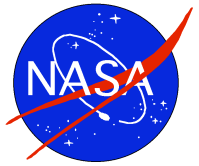


- ***LAT SIIS ATP has been received and is in review***
  - *ATP week of 9/13 – ship end of week (pending ATP review)*
  - *Installation begins 9/21*
- ***LAT SDIS Loaner – Will be returned to Spectrum when SIIS is delivered.***
  - *In the meantime, SLAC to ship NRL CPU (K2) back to Spectrum for 'upgrade'. (Spectrum can use this K2 until Loaner is back.)*
- ***LAT ISIS: FSW version delivered to ISIS team 9/10***
  - *Delivery targeted for 4 weeks after SIIS delivery*
  - *ATP scheduled to be run at SLAC: 10/20-22. Delivery the following week to Spectrum*
- ***GBM ISIS:***
  - *Delivery date to Spectrum (which they say they can make): 10/15.*
- ***MTS: CCR responded to by SAI***
  - *247 – Provided Clarification on approach to SAI – awaiting ROM*

Ground System - Accomplishments

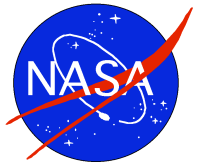
- ***LISOC conducted successful CDR on August 3rd***
  - *Significant progress demonstrated since PDR in March*
  - *GLAST project contributed to that success:*
    - *John Teter*
    - *Ernest Canevari*
    - *Erik Andrews*
- ***Conducted successful ground system SDR (8/18-19) with all elements participating***
  - *30+ RFAs written*
  - *Responses to almost all the RFAs have been drafted*
- ***GSFC procurement finalizing MOC contract package: expect contract signing mid-September***
- ***Implemented CCB "system" to baseline ground system documents (Steve Schneider/CMO)***
- ***Continued to work two open SRR RFAs ("Responses prepared, waiting to hear back from originators.")***

MOC - Accomplishments



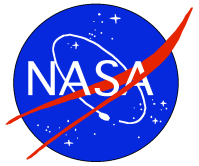
- ***Closed out all RFAs generated at the MOC DDPR***
- ***Delivered the following documents for baselining:***
  - *MOC Functional & Performance Requirements,*
  - *DB Format and Naming Convention*
  - *Procedure & PROC Style Guide documents*
  - *MOC CM Plan*
- ***Delivered the following documents for review:***
  - *draft MOC Test Plan*
  - *draft MOC Security Plan*
  - *MOC Development Plan revision 1.2*

SSC - Accomplishments



- ***GSSC participated in Ground System Review.***
- ***Received 7 RFAs from GSSC peer review — 2 now addressed, 4 assigned and being worked; and 1 belonged to GOWG (also in work).***
- ***New Hire: Don Horner, programmer/analyst for User Support***
- ***Baselined the GSSC Design document***
- ***Made presentations at GLAST Users' Committee meeting, Aug 9-10 — science analysis tool development, etc.***
- ***Dirk Petry's EGRET albedo analysis reveals orbital dependences — relevance for GLAST background rejection.***
- ***Jim Chiang's additions to Likelihood (main LAT analysis tool) include capability for model spectra and counts maps; version for Likelihood binned analysis tool initiated.***
- ***Masa Hirayama made 1st releases for two pulsar tools — barycenter correction and periodicity test tools; evaluated extant pulsar Ftools.***
- ***Robin Corbet et al. — forward progress on Tako development.***
- ***Science Analysis Software group (LAT+GSSC) made 1st build of the science analysis tools.***

Launch Vehicle - Accomplishments



- ***MIWG successfully completed at Boeing HB 8/27/04***
  - *Revise Questionnaire by end September for KSC to present to ERB*
  - *Project to resolve TBD GN2 purge requirement*
    - *Revised ACD He charts with note on SIRU*
  - *Use orbit dispersions of +/- 5 km as requirement in Questionnaire*
  - *Work SLC 17 contingency propellant offload with KSC/Range Safety*
  - *GD/SASS to provide test plan for structural qual testing with TPAF*
  - *Include real launch window requirement in Questionnaire*
  - *GSFC action to resolve TPAF conflict*
- ***Launch Service ATP on track for end November 2004***
  - *Kickoff MIWG tentatively scheduled for mid-January 2005*
- ***KSC authorized Boeing to provide 2nd CLA preliminary results directly to Project prior to KSC formal review***
  - *On Swales FTP site 9/09/04*